

What is claimed is:

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- comprising:
1. An automatic exposure adjusting device,  
an image sensor having an adjustment capability;  
an analog to digital converter which produces a digital output indicative of an output of said image sensor;  
a first counter which counts a number of overexposed parts of said image;  
a second counter which counts a number of underexposed parts of said image;  
a plurality of threshold detectors which compares counting results of said first and second counters with desired thresholds; and  
a decision element, which makes a decision to either increase an exposure of said image sensor or decrease an exposure of said image sensor based on said relation with said threshold.
  2. A device as in claim 1, wherein said image sensor includes a plurality of pixels, said analog to digital converter

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produces its digital output indicative of each pixel, and further comprising a coincidence detector, which reviews only a predetermined number of most significant bits of said digital output.

3. A device as in claim 2, wherein said first counter counts a number of pixels whose most significant bits include ones.

4. A device as in claim 3, wherein said second counter counts a number of pixels in which said most significant bit includes a zero.

5. A device as in claim 3, in which said second counter counts a number of pixels whose most significant bit includes at least one zero.

6. A device as in claim 5, wherein said threshold detectors include values indicative of what percentage of the image can have underexposed or overexposed pixels, said decision

element increasing or decreasing said exposure based on said percentages.

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7. A device as in claim 2, wherein there are two coincidence detectors representing relationships with two different thresholds, one of which is for an overexposed image and another of which is for an underexposed image.

8. A device as in claim 7, wherein said decision element reduces an exposure time for said overexposed image and increases the exposure time for said underexposed image.

9. A device as in claim 2, wherein there are at least three of said coincidence detectors detecting at least three different features including an overexposed image, an underexposed image, seriously underexposed image, and a seriously overexposed image.

10. A device as in claim 9, further comprising a threshold storing element, storing first and second increase and decrease

thresholds, an overexposed or underexposed image being increased or decreased by said first threshold, and the seriously over exposed or under exposed image being increased or decreased by said second threshold.

11. A device as in claim 1, wherein said image sensor includes an active pixel sensor with a plurality of pixels of CMOS image sensor, each pixel including an in-pixel buffer transistor and in-pixel selection transistor.

12. A device as in claim 1, wherein there is a first threshold for a seriously deficient image and a second threshold for a less seriously deficient image, said first and second thresholds collectively adding up to more than 100%.

13. A device as in claim 1, wherein said exposure is one of a shutter width or a gain of the image sensor.

14. An automatic exposure adjusting image sensor device, comprising:

an image sensor, including a plurality of adjustable photoreceptors, each photoreceptor defining a pixel of the image, and said image sensor having an adjustable exposure which when increased increases an amount of exposure, and when decreased, decreases an amount of exposure;

an analog to digital converter which obtains a analog output from said image sensor and produces a digital output indicative of said analog output to thereby produce a plurality of digital outputs for said plurality of pixels;

a pixel characterization element, investigating only certain most significant bits of at least a plurality of said digital outputs, to thereby characterize said pixel according to its exposure characteristic;

a counter element, which counts numbers of pixels characterized by said pixel characterization element and compares said count with certain thresholds; and

an image adjusting element, which adjusts said exposure based on said count.

15. A device as in claim 14, further comprising a memory storing said thresholds, and said memory is variable to change said thresholds.

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16. A method of automatically determining exposure control for an image comprising:

obtaining a plurality of digital values, said plurality of digital values representing values of said pixels;

setting a variable threshold for overexposed pixels;

setting another variable threshold for underexposed pixels;

characterizing said digital values to determine if they represent overexposed pixels, normally-exposed pixels or underexposed pixels; and

if a number of overexposed pixels is greater than said threshold, then increasing an exposure and if the number of underexposed pixels is greater than said second threshold then decreasing the exposure.

17. A method as in claim 16, wherein said investigating comprises obtaining only a number of most significant bits of

said pixels and not all bits of said pixels and investigating said most significant bits.

18. A method as in claim 17, wherein an over exposed pixel is taken as one whose two most significant bits are "11".

19. A method as in claim 18, wherein an under exposed pixel is taken as one in which its most significant bit is zero.

20. A method as in claim 17, further comprising detecting seriously overexposed and underexposed pixels as well as moderately overexposed and moderately underexposed pixels.

21. A method as in claim 20, wherein said changing an exposure comprises changing the exposure by one amount for seriously overexposed or underexposed pixels and changing the exposure by another amount for less-seriously underexposed or overexposed pixels.